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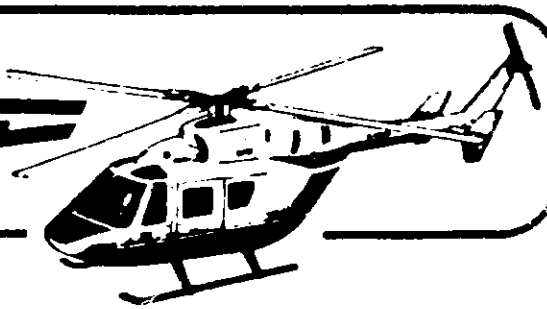
MODELLBAU Schlüter



Building- and Opperation-instructions

Three-blade-rotor Order No. 2817
Four-blade-rotor Order No. 2818

Preface

It is assumed for the following definitions that certain experiences with model helicopters already exist, thus only the relative points for the three- and four-blade rotor heads, which differ from the known two-blade rotor heads with stabilizing device, are described. Beside this, the information provide an addition for the already supplied building instructions.

Assembly

The three- and four-blade rotor heads differ only by their number of rotor blades, i.e. the number of blade mounts and the required rotor hubs. (Square-rotor-hub, Order No. 3513 for four-blade-rotor, Three-corner-rotor-hub, Order No. 3514, for Three-blade-rotor). All heads are provided with the same bearing sleeve (3515) screwed to the hub, with the blade bearing shaft (3516) with the bolt (3512) fitted inside. Slided onto the blade bearing shaft are: absorber rubber (35o6), spacer sleeve (3517), second absorber rubber (35o6) and washer (1585). (Shown at A, figure 1). This unit serves as absorbing element and allows the blade-bearing-shaft (3516) and thus the entire blade connection with the rotor blade, a certain up- and down-movement, i .e. the so called "flapping movement". So, each rotor blade has its own independent "flapping hinch", providing an individual own movement for each blade, transmitted to the main rotor and thus to the whole helicopter in a dampened way.

The adjustment of the rotorblades, i.e. the blade pitch is executed by the blade-pitch-lever (3518), which turns the blade mount (35o4) on the blade-bearing-shaft (3516). The radial forces (up- and down-movement of the rotor blade) are taken by the two bearings (1552). These must be movable on the shaft (3516) for construction reasons. The axial forces (pull of the rotorblade by the centrifugal forces to the outside) are taken by the thrust bearing (35o9) and are transferred by the ring (35o3) to the blade mount (35o4). On mounting the thrust bearing (35o9), it is of importance that the bearing ring with the larger inner hole (6,2 mm dia.) is fitted first onto the pin of the blade-bearing-shaft (3516), (towards the rotor hub). Only then the balls with ball casing and the washer with the smaller diameter (6,o mm dia.) are applied. Screw o81 (absolutely free of grease) must be fitted with "Loctite" screw-securer (!). The same applies for the screws (o84) for the attachment of the bearing sleeves (3515) to the various rotor hubs.

On initial delivery, the rotor heads are pre-assembled, thus the afore mentioned definitions are stated for a better understanding for the technical construction of the rotor-head and as advice for occasional checking- and maintenance procedures. Pay attention to the security and proceede with care and caution.

Control

of the three- and four-blade-rotor-heads are executed directly by the swash-plate, without application of a stabilizing remedy. For the "Cyclic-control (tilt of the rotor in one direction= direction control) the swashplate has to be tilted. For the "collective pitch" (changing of the lift capacity of the rotor = up- and down-movement) the swashplate has to be moved up and down. This is executed by a three-point-attachment, i.e. control of the swashplate as shown at figure 2. For this control procedure, a radio control unit with mixing facilities for rolling, tilting and pitch is required. A mechanical mixing function is described separately.

As shown at figure 2, the servos 1 and 3 control by linkage 1 and 3 the angled levers 1 and three and with this the swashplate at the right on point 1 and left on point 3. (All side descriptions viewed in flight direction). If the servos 1 and 3 are counter-activated, a tilt of the swashplate to the right or left is achieved, i.e. the control function "rolling". The servo number 2 controls by the linkage 2, the lever 2 and the point 2 at the swashplate, function "tilt". If the servos 1, 2 and 3 are mutually activated in the same direction, a lift and descent movement of the swashplate is achieved, the function "pitch".

Normally, these functions are defined for modern radio units for helicopters with roll-tilt and pitch mixing.

The connection between swashplate and rotor
is shown at figure 3 and 4. It shows the position of the various ball fittings, i.e. the rod connections for the different rotor heads. The swashplate "Champion" is already provided with all required threaded holes. On adjustment of the swash-plate follower, it is important that the rotor blades receive always a pre-setting of exactly 90° to the swashplate. (Applies for three- and four-blade rotor). Rod-connection will be according to figure 3, (Four-blade-rotor).

The Rotor-blades
have been tested during long checking procedures and are prepared to coincide with the rotor dampening. Thus, in any case the original rotor blades for the

Three-blade-rotor, Order No. 1273 or for the
Four-blade-rotor, Order No. 1274

have to be used and have to be prepared according to the instructions included to the blades. Further definitions at a later stage for "setting-procedures".

Modification- and installation-procedures for the mechanics "Champion"
(For electronical mixing of tilt, roll and pitch).
The slotted main rotor shaft (3408) with the pitchlinkage and the sliding device for the pitch linkage is no longer required, instead, the unslotted main rotor shaft (3420) is installed. The sleeves (3405) and (3406) above and under the swashplate are eliminated. The swashplate can move up and down now.
The formerly used angled lever at the left side, for the activation of the pitch sliding device, remains, but the steel ball fitting (434) has to be screwed into the lever from the outside. It's intended for the control of the swashplate at the left side. The angled lever for the forward swashplate control has to be removed and instead, the rear angled lever with the swashplate holder (3402) is moved to the front. Refer to figure 2 and 3. The short ball link (1293) on the swashplate holder (3402) is exchanged against a longer ball link (058). The lateral rods from the angled levers to the swashplate are prepared with 2 ball links each (058) with rod (3409). The connection of the control of the swashplate to the servos will be according to the pictures shown. Mounting of the steel ball fitting (434) at the upper ring of "Champion"-Swashplate, is executed according to picture 4, it varies for three- and four-blade rotor heads.

Modification- and installation-procedure for the mechanics "Superior".

(for electronical mixing of tilt, roll and pitch).

Here as well, as described for the model "Champion" the slotted main rotor shaft, pitchlinkage and the sliding device have to be removed and the shaft (342o) is installed. Furthermore, a "Champion"-swashplate, Order No. 282o has to be used. Spacer sleeves (1281) and (1282) are not necessary. The 3 angled levers for the control of the swashplate have to be modified, as described for the "Champion". For this procedure, chassis halves are altered according to figure 5. It's done best, if the chassis is removed completely. Rod-connection and position of the servos, corresponds to the "Champion" description, also the swashplate holder (34o2) with shaft (31o8) has to be installed.

In addition to the rotor head and the rotor blades (3 or 4-blade) the following items are required:

1 Main rotor shaft	Order No.	342o
1 Swashplate "Champion"	Order No.	282o
1 Swashplate holder	Order No.	34o2
1 Bearing shaft	Order No.	31o8
1 Set collar, 3 mm	Order No.	o57

Control travel (middle values) on electronical mixing

Pitch-adjustment -4° to $+ 7^{\circ}$, corresponds to a rod travel, i.e. a servo-travel of approximately 6 mm, at all three servos.

Roll- and Tilt-Adjustment of the swashplate approximately 4° to all sides, corresponds to a rod travel, i.e. a servo travel of approximately 3 mm to each side.

Rotor-blade-Installation

Since the rotor blades for the three- and four blade rotors cannot be pivoted away completely, it is recommended to remove them for transportation. For this procedure, they have to be provided with colored markings or figures for the corresponding blade mount. A colored marking at the blade tip is not recommended since it would pretend an optical unbalanced rotor. It is assumed that the blades are well balanced, as described at the blade preparation.

Checking procedure of the blade tracking is executed by marking the blade tips by applying an approximately 10 mm wide strip of black adhesive tape as follows:
Blade 1: Adhesive tape, at atmost outer blade tip.
Blade 2: Adhesive tape, one width of strip more to the inside
Blade 3: Adhesive tape, two widths of strip more to the inside
Blade 4: Adhesive tape, three widths of strip more to the inside

On a true tracking, the markings show a straight black line. Tracking differences can be clearly recognized and can be related to the corresponding blade. Marking strips have to be removed afterwards. (Only for optical reasons.)

Flight-attitude

In general, a directly controlled rotor operates differently than a rotor with a stabilizing device. The common two-blade rotor heads with Bell-Hiller-Stabilizer-Bar and control paddles are navigated in a certain flight position. On achieving this position, the cyclic blade pitch is returned to neutral and the new flight position only corrected. The reason for this is the stabilizer bar, which as well takes the new flight position and keeps it over a longer period, if no control correction is executed.

On a directly controlled rotor this function is eliminated and the initially achieved flight position has to be retained by corresponding control of the swashplate. This means that the model has to be kept in a controlled performance during all flight positions. This requires a new attitude and a change towards the initially experienced control. A renewed "Beginner-Training" should be considered and normally one cannot take it for granted to cope with the new control system from the start on. In my opinion, one should concentrate entirely on the new rotor and execute no in-between flights with the "old" rotor with the stabilizer bar. The directly controlled rotor operates differently, but is not actually harder to fly.

The directly controlled Three- and Four-blade rotor heads feature, due to their large rotating mass an outstanding "stability". The control inputs must be more articulated and must be retained, otherwise one gets the impression of a "rear up" or an "up-swing".

Example 1: Hovering flight in 1 m altitude in front of you. The model starts approaching you backwards. Now apply exact control of the swashplate to the front until the model takes a tilting position forwards.

Now do not (as you are used to) return the forward control to neutral, but reduce the forward input and lead the model to the starting point to forward. If you reached it, stop the model by lifting it, but do not oversteer. This oversteering-mistake will happen at the beginning, since you are used to the "normal" control.

Example 2: Hovering flight, then taking up forward flight, continue forward flight. With the "normal", stabilized rotor this means: Tilt of the swashplate to the front, now wait until the model also tilts to the front, take the swashplate back to neutral and correct the beginning forward flight from this neutral position. This is different for the directly controlled rotor: Tilt the swashplate to the front, wait until the model tilts, on beginning forward flight, reduce swashplate slightly, on forward flight, retain the swashplate tilt and "lead". If you navigate the helicopter in this phase as usual and if you go back to "neutral", you get the impression that the model is rearing up.

This flight attitude corresponds basically exactly to the attitude of a large-size-helicopter.

I wish you a lot of fun with the new rotor head and always

a good flight

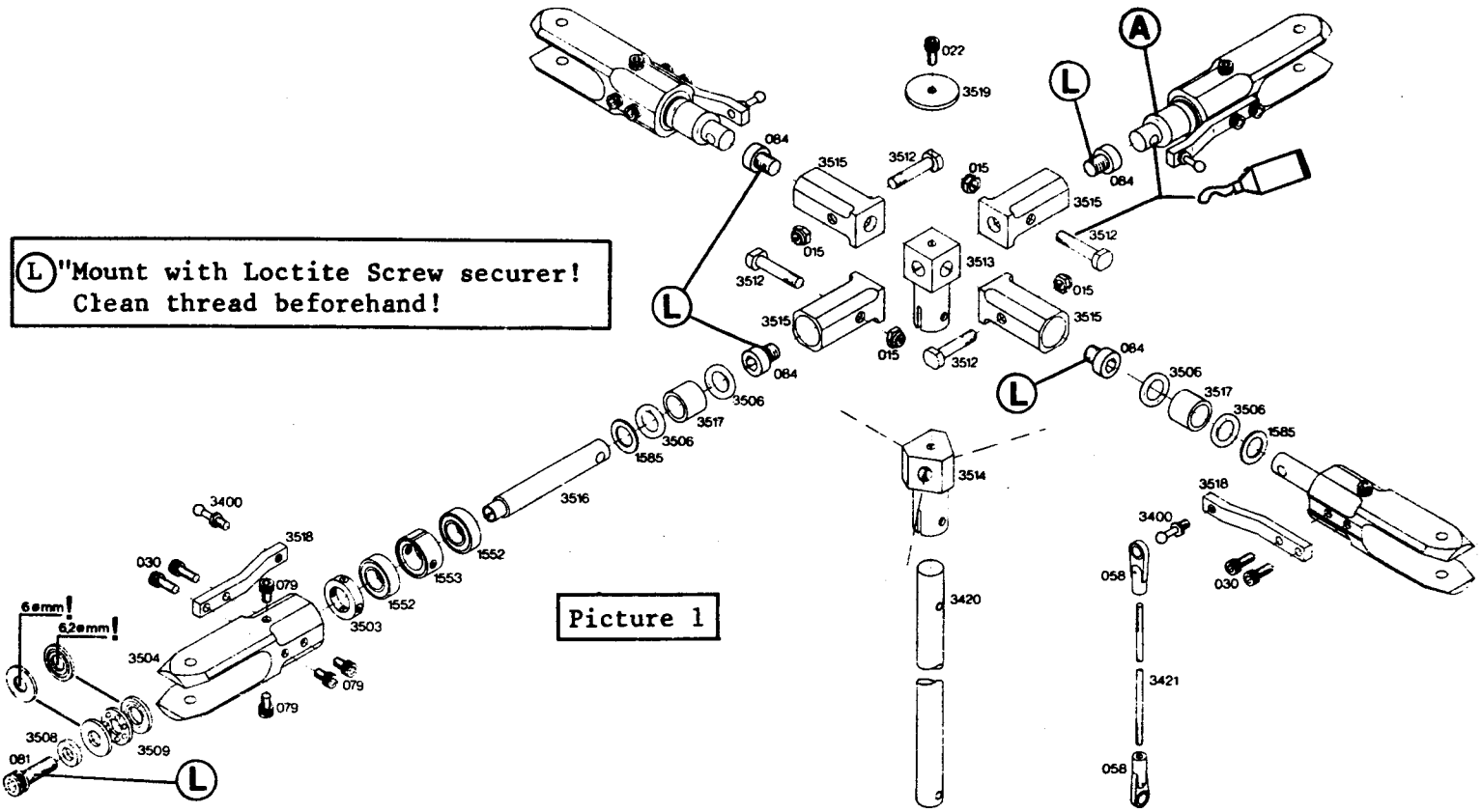
Dieter Schlüter

WARNING

A radio controlled Helicopter is not a toy but a highly complex machine that must be assembled and operated by an experienced radio control modeler. Not recommended for children. Failure in assembly, installation of accessories or operating may result in the model becoming unreasonably dangerous. The rotating rotor blades represent a permanent danger and may cause potential serious personal injury to yourself or others or property damage. Since the manufacturer has no influence on the assembly and the operation of his products, he expressively refers to the above stated danger. He does not assume any liability arising thereof.

Single parts for

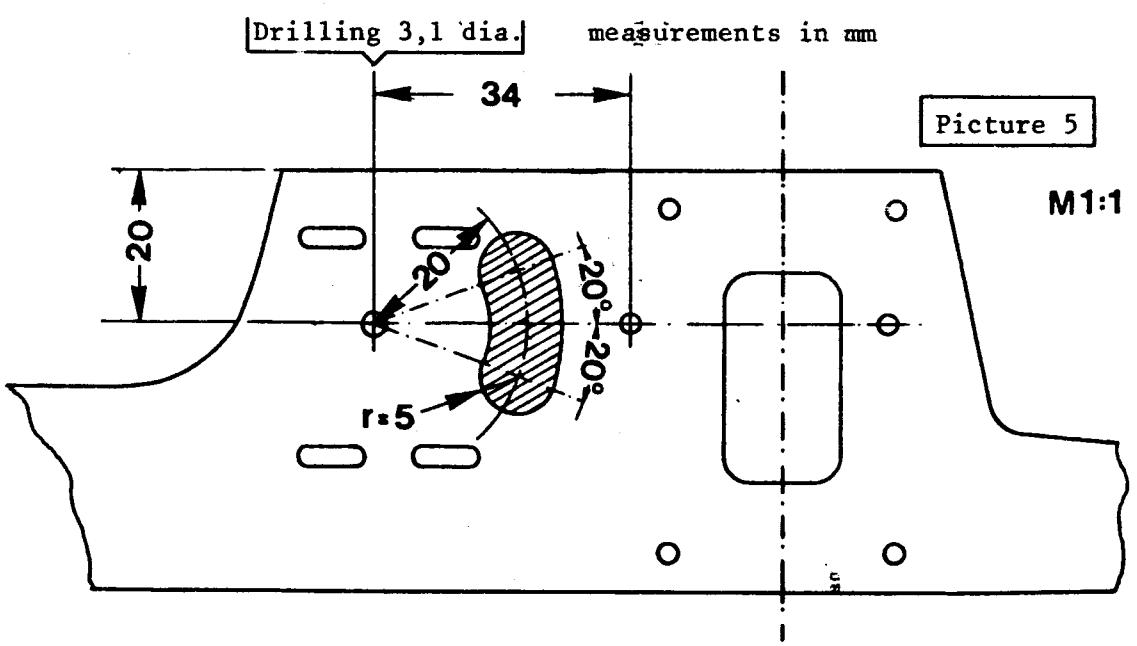
Three- and Four-blade-Rotors



Three-blade-rotor compl.(without Rotor blades) Order No. 2817

Four-blade-rotor compl. (without Rotor blades) Order No. 2818

Alterations on both side plates "Superior"
(Drill 3,1 mm dia. and ribbed marked slot)



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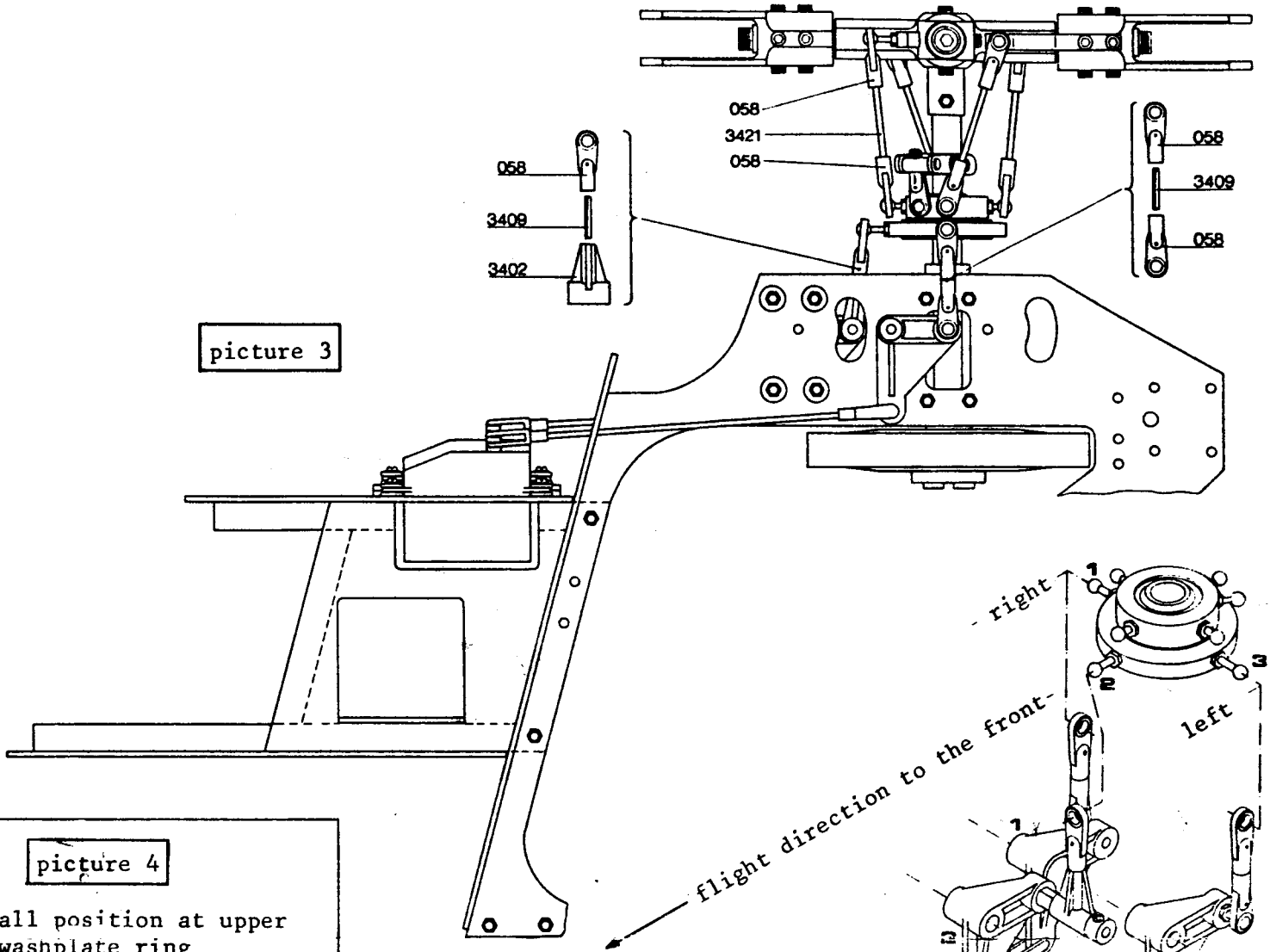
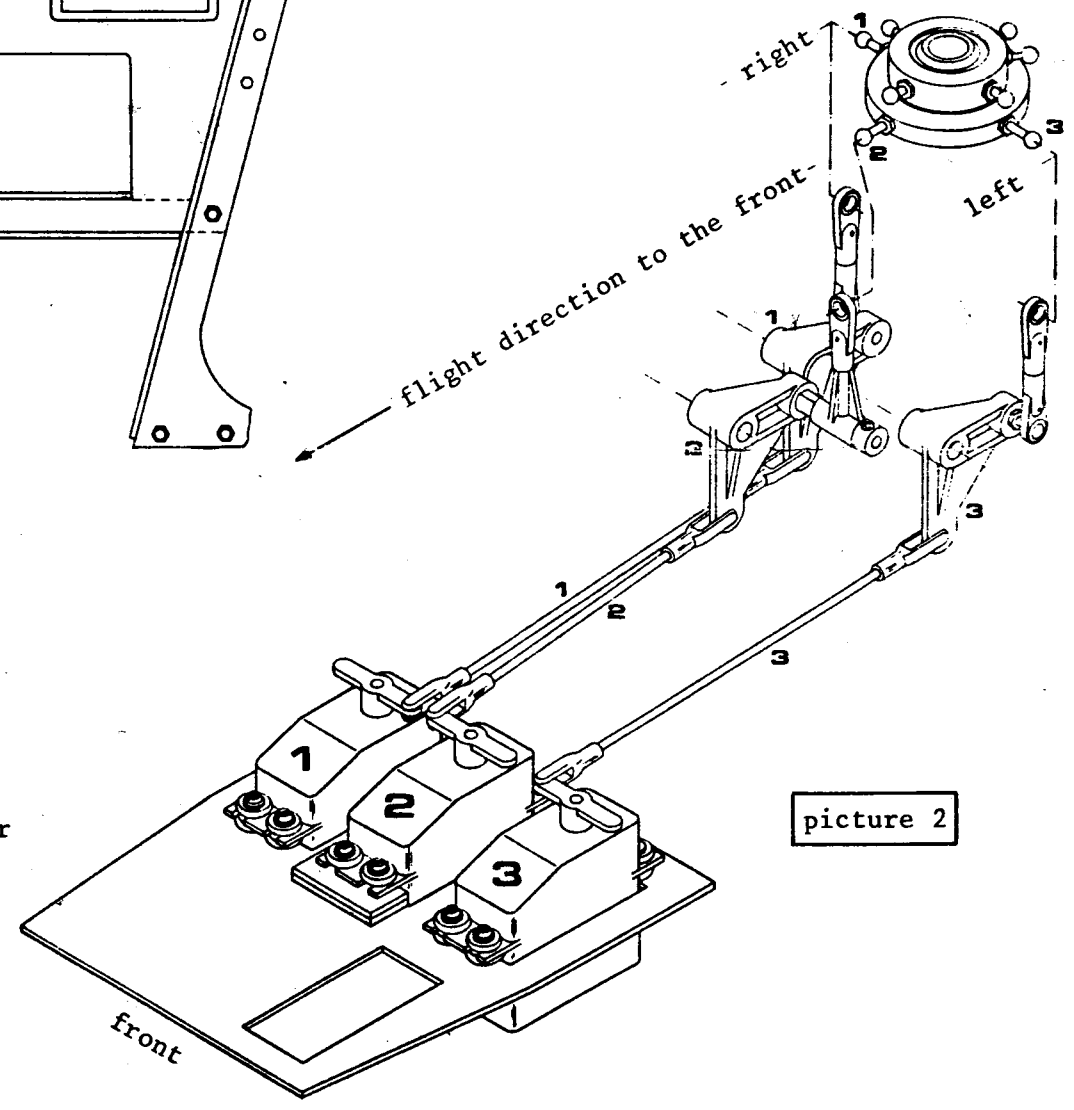


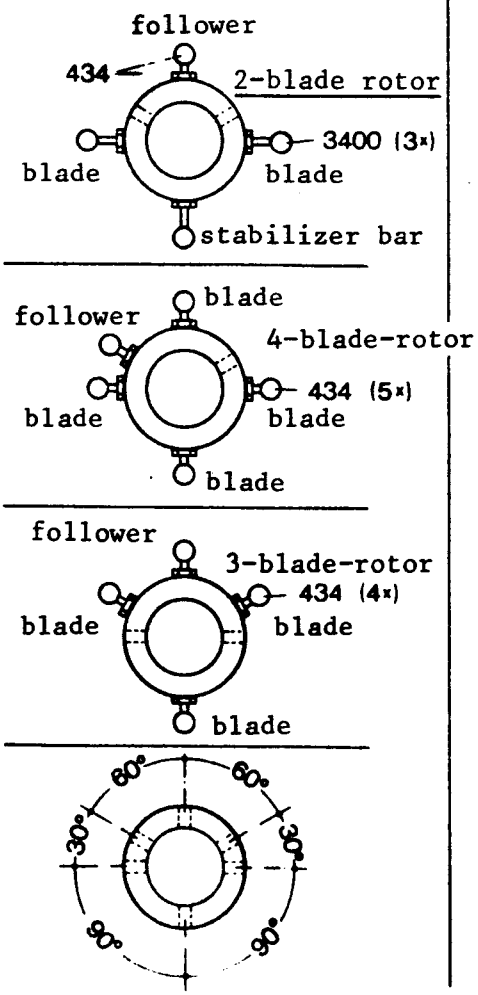
picture 3



picture 2

picture 4

ball position at upper swashplate ring



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